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Traditional usage of medicinal plants in humans and animals health care and their chemical constituents from hills and valleys of Jammu province, Western Himalaya

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In this work, a systematic attempt to explore the ethnobotanical research on native plants of Jammu province located in Western Himalaya and their phytochemical constituents is presented. The village people use locally available plants to cure frequently occurring diseases in their communities and as a tonic to maintain their health. These plants are also responsible for animal health. The main aim of this research was to establish the botanical knowledge on usages of herbal plants through systematic documentation and identification of the species involved, ecological aspects and how they were used in the biological form. During the investigation, the authors explored the entire territory examining 17 different communities. In total, 226 species of plants categorized in 73 families used by the native inhabitants as plants used in their day-to-day life for health care were observed. Scientific names, localized vernacular name, parts used, mode of usages and reported chemical constituents of particular species are reported in this report. The study indicates the existence of a very strong tie between the local people and these particular plants. While studying, the authors found peculiar uses, species, parts used and recipes, which could be very helpful in developing new formulation for human and animal health care.

Keywords: Folklore, Himalaya, Medicinal plants, Phytochemicals.

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Introduction

Botanically active medicinal plants (lianas, herbs, shrubs, trees) serve as an indispensable component for human living since they supply a diverse range of chemical ingredients required for metabolic activities[1,2]. The usage of wild plants as a source of local medicine has been inherited from ancestors and recognized as an imperative constituent of health care in India. Himalayan regions are well-known to supply life-supporting plants to humans. The reason maybe because of the remoteness and inaccessible tough terrain, the local tribal communities residing in the interior regions have largely depended on local plants for their health care[3]. The northwest Himalaya represents very distinct topographical belts having characteristic climate, geology and unique flora of high valued medicinal and endemic species[4-6].

Jammu & Kashmir region is home to several mountains and valleys whose altitude ranges from 327 to more than 8500 m a.m.s.l. The total forest area for the Jammu division is approximately 9,283 km^2 (45.89%), and the population of Jammu in 2011 was 53,50,811(ref 7), with a density of 324 people per km^2. The mountainous vegetation includes Himalayan subtropical, temperate broad-leaved, temperate conifers, sub-alpine and alpine forests. Jammu is largely dominated by the ethnic *Dogra* tribe, which constitutes approximately 47% of the total population; predominant other groups include muslims, kashmiri pandits, pahadis, bakarwals, gujjars, and migrant people from other states of India. The ethnic population constitute nomadic tribes and pastoral communities; they have mastered their indigenous knowledge to combat different diseases of humans as a gift from their ancestors which keeps on passing from generation to generation[8]. The people have a high reverence for plants since ancient times as a majority of the population lives in villages and they are economically poor. The inhabitants of this area have been dependent on plant resources for medicine, fuel, food, fodder, fibre, timber, and other purposes[9].

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The area is under heavy pressure from deforestation and overgrazing which has reduced the regeneration of woody plants[10-11].

Available published data indicated extensive ethnobotanical assessment work carried out by various ecologist and ethnobiologist from different pockets of Himalaya[12-16], especially in Jammu and Kashmir regions[17-22]. Scattered works have been reported on various tribes from Jammu province[23-28]. As such, there is very less work reported on indigenous wild plants of Jammu province and therefore, an attempt has been made to provide one place data on medicinal plants growing in Jammu regions and their major active chemical constituents, which would be helpful in research and conservation of valuable plant species.

Methodology

Study area: Geography and people

Jammu province (latitude: 32°17' to 32°55' N, longitude: 75°70' to 76°16' E) in Western Himalaya spreads in a total geographic area of 2651 km^2. The region is surrounded by Himachal Pradesh to the east and Punjab to the south. The northern part of the region is situated at the foothills of Himalaya which includes the Shiwalik range. The southern part consists of alluvial plains. The region presents a unique unit for studying the biodiversity (especially medicinal plants) of the north-western Himalayas as the climate of the area ranges from subtropical to alpine. Forest types include (a) northern dry mixed deciduous forest (altitudinal variation of 300-1200 m; annual rainfall and temperature ranges from 900-1500 mm and 18-27 °C; common plant species found in this forest are *Bombax ceiba* L., *Cassia fistula* L., *Phyllanthus emblica* L., *Senegalia catechu* (L.f.) P. J. H. Hurter & Mabb. and *Senegalia modesta* (Wall.) P. J. H. Hurter, (b) dry deciduous scrub (altitudinal variation of 350-1300 m; annual rainfall ranges from 900-1150 mm; common plant species found are *Carissa spinarum* L., *Euphorbia royleana* Boiss. and *Lannea coromandelica* (Houtt.) Merr., (c) lower shiwalik chir pine forest (elevation of 500-1000 m; annual rainfall ranges from 900-2000 mm; common plant species found in this forest area are *Mallotus philippensis* (Lam.) Mull.Arg., *Pinus roxburghii* Sarg., *Terminalia chebula* Retz., *Terminalia bellirica* (Gaertn.) Roxb.), (d) upper Himalayan chir pine forest (altitudinal variation of 1200-1800 m; annual rainfall ranges from 900-2500 m; common plant species found in this forest are *Pinus roxburghii*, *Quercus oblongata* D. Don, *Rubus idaeus* L., *Rubus ellipticus* Sm., (e) moist deodar forest (elevation of 1700-2500 m; annual rainfall ranges from 1100-1800 mm; common plant species found are *Berberis lycium* Royle, *Cedrus deodara* (Roxb. ex D. Don) G. Don, *Fragaria nubicola* (Lindl. ex Hook.f.) Lacaita, *Pinus wallichiana* A. B. Jacks, *Viburnum grandiflorum* Wall. ex DC.), (f) moist temperate deciduous forest (elevation of 2000-2800 m; annual rainfall ranges from 1800-2700 mm; common species found in these forests are *Acer caesium* Wall. ex Brandis, *Betula utilis* D. Don, *Digitalis purpurea* L., *Plantago major* L., *Podophyllum hexandrum* Royle, (g) deciduous alpine scrub (altitudinal variation of 2900-3700 m; mostly covered with snow most of the year; common plant species found in this region are *Betula utilis* D. Don, *Phlomoides bracteosa* (Royle ex Benth.) Kamelin & Makhm., *Salix alba* L., *Salvia hians* Royle ex Benth, *Stachys sericea* Cav. The area is rich in biodiversity and ethno-botanically less explored[29-30]. The objective of the research was the assessment and preservation of cultural and traditional knowledge of the medicinal plants of the area. Due to this, many researchers are attracted towards these regions to explore ethnoveterinary[31] and ethnomedicinal knowledge[32] possessed by the locals. Keeping these things in mind, the present study was undertaken to document ethnomedicinal plants of the Jammu region.

Surveys, data collection and analysis

Field trips were conducted to inventorize the plant species in different regions of Jammu province (*viz*., Jasrota, Budhi, Nagrota, Patnitop, Sanasar, Chelak, Nandini, Bani, Billawar, Uttarbehni and their adjoining areas), to document traditional knowledge, and collect plant samples. During the field survey, information regarding the local names of plant and usages of the plant species were recorded with the help of local inhabitants. The socio-economic and ethnobotanical information of the people was recorded through interviews and questionnaire from shopkeepers, local hakims, tribals and farmers. Traditional and herbal medicine practitioners have also been consulted for gathering ethnomedicinal information on the plant species of the area. Each of the plant materials was investigated and their scientific name, local name, family, part used, method of use, folk claims and mode of administration for a particular disease were identified. Plant specimens were identified using keys and regional floras such as

Flora of Jammu and Plants of Neighbourhood[33], Flora of Trikuta Hills[34], Flora of Udhampur[35], Illustration of Jammu Plants[36], and Handbook of Medicinal Herbs[37]. For proper authentication, Janaki Ammal Herbarium (acronym RRLH) of CSIR-Indian Institute of Integrative Medicine (Jammu) and Herbarium of Department of Botany, University of Jammu were consulted; web-based taxonomic database 'The Plant List' (www.theplantlist.org) and Kew Botanical Garden (mpns.kew.org) were also referred for proper and correct updated nomenclature. All the plant specimens were accessioned and are available at Janaki Ammal Herbarium. For phytochemical Investigation, major chemical constituents present in plants were worked out from published literature, SciFinder (https://sso.cas.org).

Results and Discussions

The entire territory of Jammu province examining 7 different communities with emphasis on ethnic tribe and subtribe belonging to dogra, pahadis, bakarwals and gujjars were explored. During the study, 38 local herbal practitioners were interviewed residing in 10 villages coming under Jammu regions and found that only 19 informants (3 female and 16 male) possessed maximum information on traditional usages of local plants growing in their regions. It was observed that in a particular community, only one or two people has ethnobotanical knowledge. However, after consulting people, it was found that people living in the surrounding of the herbal man also possessed knowledge of a few plants. People who practice traditional medicine were not very educated and the maximum education level was up to matric (their age ranged between 57-70 years); however, their children had college-level education. Therefore, it can be said that older informants usually had greater knowledge of ethnomedicinal plant species locally available than younger age people. This study is in line with reported ethnobotanical surveys which revealed that local medical knowledge bearers are mostly illiterate, poor, and lived rural-based livelihood[38-40]. A total of 226 plant species belonging to 184 genera and 73 families were identified to be used as ethnomedicinally important plants in Jammu province (Table 1, Fig. 1). In total, herbs represented 126 species (55.75%) as the dominant life-form, followed by 53 species of trees (23.45%), 38 species of shrubs (16.81%) and 9 species of climbers (3.98%). Different percentages of the plant parts, such as root, stem, leaves, bark, and fruit, were used by the local inhabitants as a source of medicine (Table 2). Leaves of 95 plant species were used as medicine. *Achyranthes aspera* L., *Ageratum conyzoides* L. and *Barleria cristata* L. are the common species whose leaves were frequently used as a source of medicines, while *Abies pindrow* (Royle ex D. Don) Royle and *Butea monosperma* (Lam.) Kuntze is recorded here as the uncommon plants whose leaves are used as medicine. Roots of 45 plant species were used as a remedy for various ailments. *Abrus precatorius* L., *Albizia lebbeck* (L.) Benth., *Amaranthus spinosus* L.

Fig. 1 — Ethnobotanical investigation and collection of plant samples. a-b) Collection of data, c) *Bergenia ciliata* (Haw.) Sternb., d) *Potential nepalensis* Hook., e) *Cedrus deodara* (Roxb. ex D. Don) G. Don, f) *Taxacum campylodes* F. H. Wigg.

Table 1 — Local herbal medicinal plants and their major chemical constituents growing in Kathua, J&K Province (India)

Scientific Name	Vernacular name	Part used	Habit	Medicinal uses	Major chemical constituents
Brassicaceae					
Arabis alpina L.	Pahari sabji	Lvs	H	Fresh leaf juice used for heart diseases.	Dicamba, glufosinate, glyphosate, fatty acids, sinigrin.
Barbarea intermedia Boreau	Jungli sasoo	Lvs	H	Cure fresh cuts and wounds.	Glucosinolates, apigenin, flavonoids.
Nasturtium officinale W.T.Aiton	Jal-indushoor	Wp	H	Used for chronic stomach illness.	Glucosinolates, flavonoids, carotenes.
Berberidaceae					
Berberis lycium Royle	Kavelli	Wp	S	Cure jaundice.	Alkaloids, berberine, tannins, saponins, flavonoids.
Sinopodophyllum hexandrum (Royle) T. S. Ying	Ban kakkdi	Rh	H	Taken as an intestinal purgative. Rhizomes poisonous when taken by mouth.	Lignin glycosides, podophyllotoxin, podophyllic acid and picropodophyllin, α-peltalin, β-peltalin.
Capparaceae					
Crateva adansonii DC.	Baml	Ba	T	Liver stimulant and laxative.	Astragalin, linolenic acid, lupeol, nicotinic acid, oleic acid, rutin.
Menispermaceae					
Cissampelos pareira L.	Battal bel	Rt	C	Act as antidote to snake poison.	Root extract contains terpenoids, alkaloids, tannins, amino acid proteins, and carbohydrates.
Tinospora sinensis (Lour.) Merr.	Giloi	St	H	Act as anti-diabetic, hair tonic and brain tonic.	Benzoin, camphor, palmatine, alkaloids.
Papaveraceae					
Argemone mexicana L.	Peeli kandiyari	Sd	H	Treat skin inflammations.	Alkaloids, berberine, flavonoids, tannins.
Fumaria indica (Hausskn.) Pugsley	Pit pappada	Wp	H	Taken to cure digestive problems.	Alkaloids, protopine, flavonoids, tannins, bilirubin.
Ranunculaceae					
Caltha palustris L.	Panjali Kanval	Rt, Fl and Sd	H	Applied to cure skin problems such as cuts and boils.	Carotenes, fatty acids, polysaccharides, phosphates, gondoic acid, magnoflorine.
Clematis buchananiana DC.	Berkellu	Wp	S	Cure scabies.	Chamazulene.
Clematis gouriana Roxb. ex DC.	Total	Wp	C	Paste applied to cure skin cancer.	Ascorbic acid, humic acids, riboflavin, alkaloids, camphor, carvone.
Ranunculus distans D.Don	Chim	Wp	H	Act as stimulant, diuretic and also used to cureskin infections.	Gibberellins, konjac, simethicone.
Ranunculus laetus Wall. ex Hook.f. & J.W.Thomson	Kandira	Lvs	H	Applied on wounds, scabies and leucoderma.	Flavonoids, alkaloids, glycosides, phenols, saponins, tannins, terpenes.
Thalictrum virgatum Hook.f & Thomson	Shwetambara	Rt	H	Cure toothache.	Citric acid.
Violaceae					
Viola canescens Wall.	Vanaksha	Wp	H	Decoction taken to treat chest pain.	Saponins, alkaloids, bilirubin, rutin.
Viola odorata L.	Banfsha	Wp	H	Cure cough, asthma and fever.	Linalool, flavonoids, saponins, geraniol.
Flacourtiaceae					
Flacourtia indica (Burm.f) Merr.	Kakkoya	Fr	S	Fresh fruits cure jaundice.	Flavonoids, alkaloids, fatty acids, hirsutrin.

(*Contd*.)

Table 1 — Local herbal medicinal plants and their major chemical constituents growing in Kathua, J&K Province (India) (*Contd*.)

Scientific Name	Vernacular name	Part used	Habit	Medicinal uses	Major chemical constituents
Caryophyllaceae					
Stellaria media (L.) Vill.	Koku	Wp	H	Applied as plaster on swellings and broken bones.	NA
Portulacaceae					
Portulaca grandiflora Hook.	Dupahar raja	Lvs	H	Taken as diutretic vegetable.	Betacyanins, betalains, betanin.
Hypericaceae					
Hypericum perforatum L.	Bankehdi	Wp	C	Act as diuretic and antihelmintic.	Hypericin, hyperforin, quercetin, rutin, flavonoids.
Malvaceae					
Bombax ceiba L.	Simbal	Rt and Fr	T	Act as stimulant, fruit are used to treat kidney ulcer.	Flavonoids, tannins, fatty acids, lupeol.
Kydia calycina Roxb.	Pulla	Lvs and Ba	T	Cure body pains.	Linoleic acid, linoleic acid.
Malvastrum coromandelianum (L.) Garcke	Baddi beryaad	Wp	H	Cure dysentery.	Alkaloids, saponins, phenolic, tannins
Sida cordata (Burm.f) Borss. Waalk.	Demehdi	Rt and Lvs	H	Cure fever and urinary problems.	Glutathione, alkaloids, caffeic acid, flavonoids, gallic acid, glycosides, saponins.
Geraniaceae					
Geranium nepalense Sweet	Baanda	Wp	H	Used against renal disorders.	Tannins, glycerine, sorbitol.
Geranium wallichianum D. Don ex Sweet.	Laal jehari	Wp	H	Taken in toothache.	Herniarin, tannins, anthraquinone, aurone, camphene, carotenes.
Balsaminaceae					
Impatiens balfourii Hook.f.	Gulmehandi	Lvs and Fl	H	Treat pain in joints.	Flavonoids, gallic acid, kaempferol.
Rutaceae					
Aegle marmelos (L.) Corrêa	Bael	Fr	T	Used in the treatment of chronic diarrhoea, dysentery and ulcers.	Alkaloids, flavonoids, tannins, saponins, terpenes.
Murraya koenigii (L.) Spreng.	Kuddy patta	Lvs	S	Cure diabetic problems.	Alkaloids, flavonoids, tannins, saponins, linalool.
Skimmia laureola Franch.	Katurcharu	Ba and Lvs	S	Cure swellings and joint pain.	Linalool, geraniol, limonene, sabinene, vermiculite.
Zanthoxylum armatum DC.	Timbru	Wp	S	Used in fever; fruits and branches used for toothache.	Linalool, limonene, flavonoids.
Meliaceae					
Azadirachta indica A.Juss.	Neem	Lvs	T	Act as insect repellent.	Azadirachtin, limonoids, flavonoids, tannins.
Melia azedarach L.	Draink	Ba and Lvs	T	Used for skin troubles, leaves are antiseptic.	Matrine.
Rhamnaceae					
Ziziphus jujuba Mill.	Badi Ber	Sd, Ft and Ba	T	Used for anxiety, insomnia.	Triterpenic acids, flavonoids, cerebrosides
Ziziphus oxyphylla Edgew.	Choodi Beri	Lvs and Fr	T	Cure pain, diabetes and fever.	Flavonoids, tannins, alkaloids, tannins.
Sapindaceae					
Dodonaea viscosa Jacq.	Santha	Lvs	S	Cure wounds and swellings.	Flavonoids, saponins, tannins, alkaloids.
Aesculus indica (Wall. ex Cambess.) Hook.	Ban khodi	Sd and Fr	T	Extracted oil used externally in rheumatic complaints.	Starch, aescin, aesculin, fatty acids.

(*Contd*.)

Table 1 — Local herbal medicinal plants and their major chemical constituents growing in Kathua, J&K Province (India) (*Contd*.)

Scientific Name	Vernacular name	Part used	Habit	Medicinal uses	Major chemical constituents
Anacardiaceae					
Lannea coromandelica (Houtt.) Merr.	Mohin	Lvs and Bark	T	Used for skin diseases and stomachache.	Tannins, flavonoids, alkaloids, saponin.
Pistacia chinensis Bunges	Kakkad sindi	Ga	T	Galls used in asthma.	Fatty acids, linoleic acid.
Fabaceae					
Abrus precatorius L.	Ratti	Rt	C	Decoction used in cough and cold, colic pain and rheumatism.	Flavonoids, alkaloids, saponins, tannins.
Senegalia catechu (L.f.) P. J. H. Hurter & Mabb.	Khair	Wd	T	Cures mouth ulcer.	Sesame oil, camphor, catechin, tannins.
Senegalia rugata (Lam.) Britton & Rose (Willd.) DC.	Shikakai	Lvs	S	Treat jaundice and constipation.	Saponins, flavonoids.
Senegalia modesta Wall.	Phalai	Ba	T	Act as astringent.	Tannins, fatty acids, flavonoids, alkaloids, linoleic acid.
Vachellia nilotica (L.) P. J. H. Hurter & Mabb.	Babul	Ba	T	Cure skin diseases.	Tannins, phenols, flavonoids, gallic acid, alkaloids, saponins.
Albizia chinensis (Osbeck) Merr.	Oola	Ba	T	Applied on cuts and wounds.	Flavonoids, tannins, alkaloids, saponins.
Albizia lebbeck (L.) Benth.	Sareen	Rt	T	Root powder used as gum tonner.	Flavonoids, saponins, tannins, alkaloids, fatty acids.
Argyrolobium roseum Jaub & Spach.	Makhni buti	Wp	H	Used as anti-diabetic	Carbohydrates, flavonoids, gallic acid.
Bauhinia variegata L.	Kachnar	Ba and Rt	T	Cure asthma and ulcers.	Tannins, flavonoids, alkaloids, saponins.
Butea monosperma (Lam.) Kuntze	Palah	Lvs and Fl	T	Used as tonic, flowers as diuretic and antiseptic.	Flavonoids, tannins, alkaloids, saponins.
Cassia fistula L.	Amaltas	Lvs, Rt and Sd	T	Act as laxative.	Flavonoids, tannins, alkaloids, saponins.
Senna occidentalis (L.) Link	Badi aedma	Lvs and Sd	T	Act as purgative.	Emodin, flavonoids, tannins, saponins.
Chamaecrista mimosoides (L.) Greene	Patwa ghaas	Lvs	S	Applied to treat skin problems.	Flavonoids.
Dalbergia sissoo Roxb. ex DC.	Shisham	Rt and Wd	T	Cure leprosy and against vomiting.	Tannins, carbohydrates, dalbergin.
Ototropis elegans (DC.) H.Ohashi & K.Ohashi	Motha	Rt	S	Used as analgesic and anti-inflammatory.	Resins, alkaloids, behenic acid.
Indigofera heterantha Wall. ex Brandis	Sakhini	Lvs	S	Act as anti-microbial.	Flavonoids, eupalitin.
Indigofera articulata Gouan	Neeli	Wp	S	Extract given in epilepsy and nervous disorders.	Flavonoids, tannins, alkaloids, saponins.
Lespedeza juncea (L.f.) Pers.	Bhaisaanoi	Rt	H	Treat diarrhoea and dysentery.	Citric acid.
Robinia pseudoacacia L.	Locust	Fl	T	Act as diuretic, laxative.	Flavonoids, citric acid.
Senna tora (L.) Roxb.	Aedma	Lvs, Sd and Rt	H	Dried fruits used as a purgative	NA.
Trifolium pratense L.	Tripatra	Wp	H	Used as anti-inflammatory, sedative.	Genistein, isoflavones, daidzein.
Rosaceae					
Fragaria vesca L.	Strawberry	Lvs and Fr	H	Act as diuretic, laxative and tonic.	Anthocyanins, flavonoids.
Potentilla reptans L.	Hebre	Wp	H	Used as anti-spasmodic and astringent.	Hydrolysable tannins, proanthocyanidins, flavonoids and triterpenes

(*Contd*.)

Table 1 — Local herbal medicinal plants and their major chemical constituents growing in Kathua, J&K Province (India) (*Contd*.)

Scientific Name	Vernacular name	Part used	Habit	Medicinal uses	Major chemical constituents
Prinsepia utilis Royle	Bhikal	Sd	S	Oil applied in rheumatism.	Glycerol, citric acid, fatty acids.
Pyrus pashia Buch.-Ham. ex D.Don	Kainth	Fr	T	Used for conjunctivitis.	Flavonoids, ascorbic acid, tannins.
Rosa moschata Herrm.	Kareer	Rt	S	Used in eye infections.	NA
Rubus ellipticus Sm.	Akhre	Fr and Rt	S	Act as astringent and febrifuge.	Flavonoids.
Rubus idaeus L.	Choti akhre	Lvs	S	Cure gastrointestinal disorders and diarrhoea.	Ellagic acid, flavonoids.
Saxifragaceae					
Bergenia ciliata (Haw.) Sternb.	Zakhme ae hayat	Rt	H	Used to cure fevers, diarrhoea and cough as astringent.	Bergenin, tannins, flavonoids, gallic acid.
Araliaceae					
Hedera nepalensis K. Koch	Karuri	Lvs	C	Act as stimulant.	Glycerol.
Combretaceae					
Terminalia bellirica (Gaertn.) Roxb.	Bheda	Lvs and Fr	T	Used to treat liver disorder, respiratory problems.	Tannins, flavonoids, alkaloids.
Terminalia chebula Retz.	Arhad	Lvs and Fr	T	Act as laxative, astringent.	Tannins, gallic acid, flavonoids.
Myrtaceae					
Syzygium cumini (L.) Skeels.	Jamun	Ba and Sd	T	Used to cure diarrhoea, diabetes and asthma.	Flavonoids, tannins, gallic acid.
Lythraceae					
Punica granatum L.	Anar	Rt and Fr	S	Used in dysentery and diarrhoea.	Ellagic acid, citric acid.
Woodfordia fruticosa (L.) Kurz.	Dhai	Lvs	S	Taken as tonic and to cure headache.	Tannins, gallic acid, flavonoids.
Cucurbitaceae					
Momordica dioica Roxb. ex Willd.	Murella	Rt	C	Cure urinary infections.	Flavonoids, saponins, alkaloids, fatty acids.
Solena amplexicaulis (Lam.) Gandhi	Amantamul	Lvs	C	Cure inflammation.	Flavonoids, alkaloids, saponins, terpenes.
Caprifoliaceae					
Valeriana jatamansi Jones ex Roxb.	Mushkbala	Rt and Ol	H	Cure nervous unrest.	Camphene, limonene.
Adoxaceae					
Viburnum grandiflorum Wall ex DC.	Khlana	Fr	S	Used as laxative and blood purifier.	Betulin, flavonoids, alkaloids.
Rubiaceae					
Galium aparine L.	Khoorti	Wp	H	Juice taken as diuretic.	Dicamba, atrazine, linuron.
Rubia cordifolia L.	Majith	Lvs	H	Applied for skin diseases.	Mollugin, purpurin.
Asteraceae					
Ageratum conyzoides L.	Neeli jhadi	Lvs	H	Juice useful in proplepsis.	Flavonoids, alkaloids, tannins.
Anaphalis busua (Buch.-Ham) DC.	Bukiful	Lvs	H	Cure wounds, cuts and bruises.	Arbutin, copaene, cubenol, ellagic acid.
Anaphalis contorta (D.Don) Hook.f.	Bukiful	Fl	H	Used to cure joint pains	Terpenes, linalool, nerol, limonene.
Anaphalis nepalensis (Spreng.) Hand.- Mazz.	Chora	Lvs	H	Used to treat jaundice.	NA.
Anaphalis nubigena DC.	Chora	Lvs	H	Used for treatment of skin diseases.	Aristolene, cubitene, decane.
Anaphalis triplinervis (Sims) Sims ex C.B. Clarke	Bukiful	Lvs	H	Used for eye infections.	Furanol.

(*Contd*.)

Table 1 — Local herbal medicinal plants and their major chemical constituents growing in Kathua, J&K Province (India) (*Contd*.)

Scientific Name	Vernacular name	Part used	Habit	Medicinal uses	Major chemical constituents
Aster molliusculus (Lindl. ex DC.) C.B.Clarke	Paharful	Wp	H	Used for the relief of cough and diuretic.	Carvacrol, geraniol, terpenes, thymol.
Bidens biternata (Lour.) Merr. & Sherff	Chirchitta	Rt and Lvs	H	Anthelmintic and used for skin diseases.	Caffeine, flavonoids, hyperin.
Blumea lacera (Burm.f.) DC.	Kakronda	Rt and Lvs	H	Used as anti-pyretic, diuretic and anti-helmintic.	Flavonoids, alkaloids, saponins.
Cirsium wallichii DC.	Bungsee	Lvs and Fl	H	Used as anti-bacterial, anti-fungal and anti-oxidant.	Fumaric acid, luteolin.
Conyza pinnatifida (Thunb.) Less.	Ghoraghas	Lvs	H	Used for inflammatory related problems.	Citric acid, flavonoids.
Elephantopus scaber L.	Gojialata	Lvs	H	Used to treat asthma, cough.	Brucite, quercitrin.
Erigeron bonariensis L.	Ragwed	Lvs	H	Used for urinary tract infection.	Quercitrin, camphene.
Galinsoga parviflora Cav.	Hameng shampakpi	Lvs	H	Treatment of stings and skin inflammation.	Linuron, prometryn.
Gerbera gossypina (Royle) Beauverd	Kupheru	Lvs	H	Used for blood related disorders.	NA
Gynura angulosa (Wall.) DC.	Terapaibi	St and Lvs	H	Treating wounds, headache.	NA
Himalaiella heteromalla (D.Don) Raab-Straube	Batola	Lvs, Sd and Rt	H	Leave paste applied on wounds.	NA
Jacobaea vulgaris Gaertn.	Ragwort	Lvs	H	Treat skin disorders.	Jaconine, erucifoline.
Parthenium hysterophorus L.	Gajar ghaas	Wp	H	Treat skin inflammation, rheumatic pain and diarrhoea.	Parthenin, flavonoids.
Sigesbeckia orientalis L.	Chaccheda	Wp	H	Used as diaphoretic, cardiotionic.	Caffeic acid, camphor.
Sonchus arvensis L.	Doodhli	Rt, la and Lvs	H	Used in cough, bronchitis and asthma.	Glyphosate, quercetin, simazine.
Spilanthes acmella (L.) L.	Akarkar	Wp	H	Used as anti-inflammatory, antioxidant and insecticidal.	Limonene, myrcene.
Tagetes minuta L.	Bangutti	Fl	H	Used in stomachic, diuretic and diaphoretic.	Limonene, sabinene, linalool.
Taraxacum campylodes G.E.Haglund	Bathur	Rt	H	As diuretic and chronic disorders.	Hypericin, hyperoside.
Tridax procumbens (L.) L.	Ghamra	Lvs and Fl	H	Treatment of boils and blisters.	Flavonoids, alkaloids, tannins, saponins.
Ericaceae					
Lyonia ovalifolia (Wall.) Drude	Allan	Lvs	T	Cure skin disorders.	Astilbin, glycosides, hyperoside.
Rhododendron arboreum Sm.	Burans	Lvs and Fl	T	As astringent, headache.	Flavonoids, alkaloids, quercetin, terpenes.
Primulaceae					
Anagallis arvensis L.	Dhaanri	Wp	H	As antidote for poison.	Saponins, metribuzin, flavonoids, alkaloids.
Primula denticulata Sm.	Jalkutre	Lvs and Fl	H	Used for anxiety and insomnia.	Triterpenes, flavonoids, alkaloids.
Primula floribunda Wall.	Pahari jadi	Lvs and Fl	H	Used for anxiety.	NA
Myrsinaceae					
Myrsine africana L.	Googly	Fr and Lvs	S	Decoction used as blood purifier.	Flavonoids, alkaloids, capsaicin, embelin.
Oleaceae					
Jasminum humile L.	Sanairad	Fl and Rt	S	Used for preparation of tonics and to cure ringworm problem.	Rutin, alumen, boric acid.
Jasminum multiflorum (Burm.f.) Andrews	Dhood malti	Rt and Fl	S	As antidote for snake bite and for ulcers.	Linalool, farnesol.

(*Contd*.)

Table 1 — Local herbal medicinal plants and their major chemical constituents growing in Kathua, J&K Province (India) (*Contd*.)

Scientific Name	Vernacular name	Part used	Habit	Medicinal uses	Major chemical constituents
Olea ferruginea Wall. ex Aitch.	Kouw	Lvs and Ba	T	Used as antipyretic.	Flavonoids, tannins, alkaloids, carotenes, ccitric acid.
Apocynaceae					
Calotropis procera (Aiton) W.T.Aiton	Desi akk	La	S	As antidote to scorpion sting.	Flavonoids, tannins, saponins.
Carissa spinarum L.	Garna	Lvs and Rt	S	Decoction used to get relief from fever.	Tannins, flavonoids, alkaloids.
Nerium oleander L.	Ganira	Wp	S	Used as anti-helmintic, stomachic, diuretic	Glycosides, flavonoids.
Rauvolfia serpentina (L.) Benth. ex Kurz	Sarpgandha	Rt	H	Used for high blood pressure, fever and snake bite.	Alkaloids, reserpine, ajmaline, tannin.
Gentianaceae					
Gentiana argentea (Royle ex D.Don) Royle ex D.Don	Karu	Wp	H	Treating fever, diabetes and high blood pressure.	Flavonoids, glycosides.
Gentiana kurroo Royle	Neelkanth	Rt	H	Used to treat digestive disorders	Flavonoids, glycosides, kinetin.
Boraginaceae					
Cordia dichotoma G.Forst.	Lasuda	Fr	T	As diuretic and antihelmenthic.	Tannins, flavonoids, saponins, alkaloids, glycosides.
Convolvulaceae					
Argyreia thomsonii (C. B. Clarke) Babu	Vridhadaru	Rt	C	Cure inflammation.	NA
Solanaceae					
Datura innoxia Mill.	Datura	Wp	S	Effective for pain relief.	Alkaloids, atropine, tropine.
Datura stramonium L.	Datura	Wp	S	Cure asthma.	Alkaloids, atropine, tropine.
Physalis angulata L.	Ban tipariya	Fr	C	Act as analgesic.	Alkaloids, flavonoids.
Solanum americanum Mill.	Kayan kothi	Wp	H	Juice taken to cure ulcer and skin diseases.	Paraquat, alachlor, lactofen.
Solanum surattense Burm.f.	Choti kateri	Wp	H	Used in bronchitis, cough and constipation.	Alkaloids, flavonoids, saponins.
Solanum virginianum L.	Bhiru	Wp	H	Used in treatment of epilepsy.	Alkaloids.
Scrophulariaceae					
Verbascum thapsus L.	Giddar Tambaku	Lvs	H	Used for asthma and sore throat.	Linoleic acid, aucubin.
Acanthaceae					
Barleria cristata L.	Kali barenked	Lvs and Rt	S	Cure toothache.	Flavonoids, alkaloids, glycosides.
Barleria prionitis L.	Kanda Barenker	Lvs and Rt	H	Taken in cough.	Barlerin, flavonoids, alkaloids, glycosides.
Dicliptera bupleuroides Nees	Khagri jadi	Wp	H	Extract used as tonic.	Alkaloids, carbohydrates, flavonoids.
Justicia adhatoda L.	Barenkar	Lvs	S	Used in bronchial disorders.	Alkaloids, vasicine, flavonoids, tannins.
Rungia pectinata (L.) Nees	Pindi	Lvs	H	Treatment of small pox.	Biformin.
Strobilanthes wallichii Nees	Kandali	Lvs	H	Used for inflammatory disorders.	Carbamide, taurine.
Verbenaceae					
Lantana camara L.	Panjfulli	Wp	S	Decoction given in tetanus, rheumatism and malaria.	Linalool, flavonoids, sabinene.
Lamiaceae					
Ajuga integrifolia Buch.-Ham. ex D.Don	Neel kanth	Lvs and Fl	H	Used in local herbal formulations.	Flavonoids, saponins, alkaloids, diterpenes.

(*Contd*.)

Table 1 — Local herbal medicinal plants and their major chemical constituents growing in Kathua, J&K Province (India) (*Contd*.)

Scientific Name	Vernacular name	Part used	Habit	Medicinal uses	Major chemical constituents
Colebrookea oppositifolia Sm.	Dussa	Lvs	S	Cure wounds.	Alkaloids, fatty acids, flavonoids, saponins.
Isodon rugosus (Wall. ex Benth.) Codd	Khwangere jungli	Lvs and Fl	S	Taken for toothace and gastric pain.	NA.
Isodon japonicus (Burm.f.) H.Hara	Khwangere	Lvs	S	Used for treatment of stomach cancer.	Oridonin, isodonal, nodosin, kauranes.
Leucas ciliata Benth.	Chota halkusa	Lvs and Fl	H	Act as anti-fungal, anti-oxidant and anti-microbial.	Leucine, glycine, fatty acids.
Mentha longifolia (L.) L.	Jungli pudina	Lvs	H	Used as carminative. Leaf juice act as cooling and stomachic.	Limonene, menthone, myrcene, sabinene.
Nepeta lamiopsis Benth. ex Hook. f.	Dachcha	Lvs	H	As diuretic, diaphoretic, anti-asthmatic.	Linalool.
Origanum vulgare L.	Ban tulsi	Wp	H	Used as anti-fungal, anti-inflammatory and anti-oxidant.	Carvacrol, thymol, linalool.
Salvia plebeia R.Br.	Sokh	Sd	H	Cure diarrhoea.	Caryophyllene oxide, γ-eudesmol, τ-cadinol, calamenene, copaene, γ-cadinene, cadalene, α- muurolene, ledol and α-cadinol.
Scutellaria discolor Colebra.	Nilli	Lvs	H	Treatment of wounds.	Flavonoids, chrysin, scutevulin.
Thymus serpyllum L.	Ajvain	Ol	H	Used for skin related problems.	Thymol, carvacrol, linalool, myrcene.
Thymus vulgaris L.	Jangli ajwain	Lvs and Fl	H	Used for diarrhoea, stomach ache.	Thymol, carvacrol, linalool, thyme oil.
Vitex negundo L.	Banna	Rt and Fl	S	Used as tonic, diuretic and helpful in rheumatism.	Flavonoids, alkaloids, tannins, saponins.
Plantaginaceae					
Plantago himalaica Pilg.	Ashvkarn	Lvs	H	Applied on wounds.	Acetoside, alpinoside, astilbin, ferulic acid.
Plantago lanceolata L.	Bumnu gha	Lvs and Rt	H	Used for cough and asthma.	Aucubin, catalpol, acetoside, glycosides, zinc, phosphorus, potassium.
Nyctaginaceae					
Boerhavia diffusa L.	Saandthi	Rt	H	Used as diuretic, laxative, asthma.	Flavonoids, tannins, alkaloids, saponins.
Amaranthaceae					
Achyranthes aspera L.	Puthkanda	Lvs	H	Fresh leaves applied externally on scorpion stings.	Saponins, alkaloids, tannins.
Ouret sanguinolenta (L.) Blume	Nuriya	Lvs	H	Treating diabetes and malaria.	Alkaloids, carotenes, flavonoids.
Alternanthera sessilis (L.) R.Br. ex DC.	Garundi	Lvs and Fl	H	Treatment of hepatitis, tight chest and asthma.	Flavonoids, carotenes, tannins, alkaloids.
Amaranthus spinosus L.	Chaleri	Rt and Lvs	H	Boiled roots and leaves given to children.	Flavonoids, amino acids, starch, tannins.
Chenopodiaceae					
Chenopodium album L.	Bathu	Lvs	H	Get relief from stomach pains.	Metribuzin, dicamba, bentazone.
Dysphania ambrosioides (L.) Mosyakin & Clemants	Sugandha Vastuka	Lvs	H	Cure malaria and cholera.	NA
Polygonaceae					
Bistorta officinalis Delarbre	Bistorti	Rt and St	H	Taken for digestion problems, diarrhoea.	NA.
Fagopyrum esculentum Moench	Kotu	Lvs	H	Used to lower blood pressure.	Flavonoids and rutin. roots excrete formic, acetic, citric and oxalic acids. fruit contains proteins, saccharides, lipids, fiber, vitamins and minerals.

(*Contd*.)

Table 1 — Local herbal medicinal plants and their major chemical constituents growing in Kathua, J&K Province (India) (*Contd*.)

Scientific Name	Vernacular name	Part used	Habit	Medicinal uses	Major chemical constituents
Persicaria amplexicaulis (D.Don) Ronse	Fireteil	Rt	H	Cure stomach disorders.	Quercetin and kaempferol 3-O-(5″-O-malonyl)-α-l-arabinofuranosides
Persicaria barbata (L.) H.Hara	Jal nadi	Rt and Sd	H	Extract used for washing ulcers.	NA.
Persicaria capitata (Buch.-Ham ex D.Don) H. Gross	Jungli julabi jadi	Lvs	H	As anti-bacterial, analgesic, anti-inflammatory.	Gallic acid, quercetin, flavonoids, formic acid, hirsutrn, rutin.
Persicaria glabra (Willd.) M. Gomez	Sherul	Lvs	H	Used against fever.	Avicularin, ellagic acid, flavonoids, gallic acid.
Persicaria maculosa Gray	Smartweed	Lvs and St	H	Act as diaphoretic.	Acetic acid.
Persicaria nepalensis (Meisn.) H.Gross	Ratnaulo	Lvs	H	Used as anti-fungal.	NA.
Rumex dentatus L.	Jungli palak	Rt	H	Treatment of cutaneous disorders.	Emodin, flavonoids, alkaloids.
Rumex hastatus D. Don	Ambavati	Lvs	H	Applied to cure wounds and cuts.	Flavonoids, rutin, emodin, physcion.
Rumex obtusifolius L.	Dock	Lvs	H	Cure wounds, blisters and burns.	Flavonoids.
Piperaceae					
Peperomia tetraphylla (G. Forst.) Hook. & Arn.	Charpati	Wp	H	Treatment of skin diseases, cough and asthma.	Vanillic acid.
Lauraceae					
Neolitsea umbrosa (Nees) Gamble	Dalchini	Ol	T	Treatment of itchiness and skin disorders.	Fatty acids, lauric acid, linoleic acid, oleic acid, palmitic acid.
Thymelaeaceae					
Daphne papyracea Wall. ex G. Don	Sangulu	Rt and Lvs	S	Cure cutaneous infection.	NA.
Euphorbiaceae					
Euphorbia helioscopia L.	Doodhli	Wp	H	Act as antihelmintic.	Flavonoids, fatty acids.
Euphorbia hirta L.	Bara dhudi	Wp	H	Cure female disorders, cough and asthma.	Flavonoids, tannins, alkaloids, saponins.
Euphorbia royleana Boiss.	Thor	La	S	As anti-helmintic and carthartic.	Triterpenes.
Mallotus philippensis (Lam.) Mull.Arg.	Kamla	Fr	T	Act as anti-helmintic, cathartic.	Flavonoids, alkaloids, saponins, steroids.
Phyllanthus emblica L.	Amla	Lvs and Fr	T	Used as anti-oxidant, anti-inflammatory.	Tannins, gallic acid, flavonoids.
Sapindus mukorossi Gaertn.	Rethan	Fr	T	Used to cure epilepsy, cholorosis.	Saponins, fatty acids, citric acid.
Triadica sebifera (L.) Small	Tarr charbi	Sd, Ba and Re	T	Cure cutaneous troubles.	NA.
Urticaceae					
Boehmeria macrophylla Hornem.	Shimago	Lvs	H	Taken as tonic to cure boils and dermatitis problems.	Alkaloids, alloxan, flavonoids, glycosides.
Pouzolzia rugulosa (Wedd.) Acharya & Kravtsova	Githa	Lvs	H	Used to treat diabetes.	NA.
Debregeasia saeneb (Forrssk.) Hepper & J.R.I. Wood	Puruni	Ba and Lvs	S	Act as anti-fungal.	Phytic acid, tannins.
Pilea scripta (Buch.-Ham. ex D. Don) Wedd.	Chujli gaas	Lvs	H	Cure diabetes.	Saponins.
Urtica dioica L.	Bicchu buti	Wp	H	Applied as remedy in treatment of arthritis.	Fatty acids, flavonoids.
Ulmaceae					
Celtis australis L.	Khadak	Fr	T	Used for treatment of stomache.	Tannin, gallic acid, apigenin.

(*Contd*.)

Table 1 — Local herbal medicinal plants and their major chemical constituents growing in Kathua, J&K Province (India) (*Contd*.)

Scientific Name	Vernacular name	Part used	Habit	Medicinal uses	Major chemical constituents
Cannabaceae					
Cannabis sativa L.	Bhaang	Wp	S	Act as sedative and analgesic.	Cannabidiol
Moraceae					
Ficus benghalensis L.	Borh	Lvs	T	Used as ulcer protective, leprosy and and fever.	Flavonoids, tannins, alkaloids, saponins.
Ficus palmata Forssk.	Phugada	Fr	T	Used as laxative.	Flavonoids, tannins, catechin, gallic acid.
Ficus religiosa L.	Peepal	Ba and Lvs	T	As astringent and leaves applied for skin diseases.	Tannins, flavonoids, alkaloids.
Juglandaceae					
Juglans regia L.	Akhrot	Ba and Lvs	T	Act as antihelmintic.	Citric acid, fatty acids.
Betulaceae					
Betula utilis D.Don	Burj	Ba and Tw	T	Oil extracted used to treat joint pain.	Betulin, triterpenes, flavonoids, alkaloids.
Fagaceae					
Quercus oblongata D.Don	Banjh	Lvs	T	Used to cure indigestion diarrhoea in children.	Flavonids.
Salicaceae					
Flacourtia indica (Burm.f.) Merr.	Kakkoya	Fr	T	Cure jaundice.	Chloroquine, flavonoids, alkaloids
Populus alba L.	Populus	Ba	T	Act as anti-pyretic.	NA.
Salix alba L.	Chitta baida	Ba	T	Used as antiperoidic, decoction given in rheumatism.	Salicin.
Pinaceae					
Abies pindrow (Royle ex D.Don) Royle	Raas	Lvs and Ba	T	Used in bronchitis and asthma.	Flavonoids.
Cedrus deodara (Roxb. ex D.Don) G.Don	Deodar	Ba	T	Useful in fevers, dysentery and diarrhoea.	Flavonoids, sesquiterpenes.
Juniperus squamata Buch.-Ham. ex D.Don	Chir	Ol	T	Act as carminative, diuretic.	Cedrol, limonene, sesquiterpenes, myrcene.
Picea smithiana (Wall.) Boiss.	Toos	Re	T	Cure cracks of heels and wounds.	Camphene, limonene, flavonoids.
Pinus roxburghii Sarg.	Chir	Ol	T	Used to cure joint pain.	Terpinolene.
Pinus wallichiana A.B.Jacks.	Kail	Ba and Ol	T	Applied for skin disorders, wounds, sores.	Limonene, camphene, flavonoids, myrcene.
Taxaceae					
Taxus baccata L.	Barmi	Lvs	T	Cure asthma, cough and indigestion.	Alkaloids.
Dioscoreaceae					
Dioscorea deltoieda Wall. ex Griseb.	Kill dhari	Wp	H	Juice used to treat roundworm.	Diosgenin, benzopyrene.
Asparagaceae					
Asparagus adscendens Roxb.	Sainsmaya	Tu	H	Act as cooling and diaphoretic effect.	Saponins, flavonoids, camphor.
Commelinaceae					
Commelina benghalensis L.	Kana	Wp	H	Used as diuretic, febrifugal and anti-inflammatory.	Glyphosate, diuron.
Commelina communis L.	Ghasful	Wp	H	Used to treat bleeding, diarrhoea and fever.	NA.
Aeraceae					
Phoenix sylvestris (L.) Roxb.	Khajur	Rt and Fr	T	Cure toothace, and also source of vitamins.	Flavonoids.

(*Contd*.)

Table 1 — Local herbal medicinal plants and their major chemical constituents growing in Kathua, J&K Province (India) (*Contd*.)

Scientific Name	Vernacular name	Part used	Habit	Medicinal uses	Major chemical constituents
Arisaema jacquemontii Blume	Sarp	Tu	H	Used as wormicide for animals.	Triterpenes, ellagitanins.
Acoraceae					
Acorus calamus L.	Braiyaan	Rh	H	Act as carminative, stimulant and tonic.	Camphor.
Cyperaceae					
Cyperus alulatus J. Kern	Jadi	Rh	H	As astringent, diuretic, analgesic.	NA.
Cyperus rotundus L.	Nutghas	Wp	H	Act as diaphoretic, analgesic.	NA
Eriophorum comosum (Wall.) Nees	Phurkejhar	Lvs and Rt	H	Used in treatment of diarrhoea.	NA.
Poaceae					
Arundo donax L.	Nard	Rh	H	As diuretic during menstruation.	NA.
Capillipedium parviflorum (R.Br) Stapf	Jharghas	Fl	H	Used as anti-microbial.	NA.
Cenchrus ciliaris L.	Dhaman ghaas	Wp	H	Treatment of gastrointestinal.	NA.
Chrysopogon fulvus (Spreng.) Chiov.	Dhaulu	Rt	H	Decoction used for rheumatism.	NA.
Cymbopogon martini (Roxb.) W.Watson	Gaas	Wp	H	Used as an insect repellent and also applied in skin diseases.	Geraniol, linalool.
Cynodon dactylon (L.) Pers.	Dhruv gaas	Wp	H	Used in bleeding piles and gout.	NA.
Dendrocalamus strictus (Roxb.) Nees	Kaans	La	H	Taken as tonic as well as for calcium deficiency.	NA.
Saccharum spontaneum L.	Kans	Rt	H	Used as astringent, diuretic and purgative.	NA.
Pteridaceae					
Adiantum capillus-veneris L.	Hains paidi	Wp	F	Act as demulcent, expectorant and diuretic.	NA.
Adiantum venustum D.Don	Kakkoi	Fn	F	As tonic, expectrorant and diuretic.	Triterpenes, flavonoids, saponins.
Aspleniaceae					
Asplenium trichomanes L.	Kanndeyl	Lvs	F	As laxative and expectorant.	Xyloglucan, galacturonan.
Pteridaceae					
Pteridium aquilinum (L.) Kuhn	Dadunni	Rh	F	Used as antihelmintic.	Flavonoids, pterosin B.

Note: C= Climber, F= Fern, H= Herb, S= Shrub, T= Tree, Ba= Bark, Fl= Flower, Fn= Fronds, Fr= Fruit, Ga= Galls, La= Latex, Lvs= Leaves, Ol= Oil, Re= Resin, Rh= Rhizome, Rt= Root, Sd= Seed, St=Stem, Tu= Tuber, Tw= Twig, Wd= Wood, Wp= Whole plant.

and *Barleria prionitis* L. are the common species whose roots are applied as medicine, while *Bombax ceiba* L., *Cissampelos pareira* L., *Caltha palustris* L. and *Ototropis elegans* (DC.) H. Ohashi & K. Ohashi species are lesser-known plants whose roots are used as ethnomedicine. Flowers of 19 plant species are used as a remedy for various diseases. *Butea monosperma* (Lam.) Kuntze, *Caltha palustris* L., *Impatiens balfourii* Hook. f. and *Robinia pseudoacacia* L. are some of the common species, whose flowers are used as a remedy for various local and frequently occurred ailments. In the case of whole plant usages, 44 plant species are used for curing various ailments. *Clematis buchananiana* DC., *Clematis gouriana* Roxb. ex DC., *Ranunculus distans* D.Don and *Berberis lycium* Royle are common species used as medicine.

Analysis report indicates that the top dominant families whose plant species are used as ethnomedicine are Asteraceae (25 spp.), followed by

Table 2 — Different plants parts used for various ailments in the studied area

Parts Used	Sub-category	No of species
Whole plant		46
Above ground plant parts	Barks, stems and woods	27
	Resins, latex, oils	12
	Leaves, fronds and twigs	99
	Flowers	20
	Fruits	23
	Seeds	13
	Roots	45
Below ground plant parts	Rhizomes	4
	Tubers	2
	Galls	1

Note: More than one parts of the same plant species is used for different functions

Table 3 — Number of species identified from ten dominant families with ethnobotanical usages in the studied area

Family	No of species
Asteraceae	25
Fabaceae	21
Lamiaceae	13
Rosaceae	7
Ranunculaceae	6
Solanaceae	6
Acanthaceae	6
Malvaceae	4
Rutaceae	4
Apocynaceae	4

Fabaceae (21 spp.), Lamiaceae (13 spp.), Rosaceae (7 spp.), Ranunculaceae (6 spp.), Solanaceae (6 spp.), Acanthaceae (6 spp.), Malvaceae (4 spp.), Rutaceae (4 spp.), and Apocynaceae (4 spp.) (Table 3). Therefore, this study is in-line with several other published works which indicated Amaranthaceae, Asteraceae, Fabaceae, Lamiaceae, Poaceae and Solanaceae members are the most frequently used family in hilly and mountainous regions. Almeida and Albuquerque[41] reported Lamiaceae as the richest in species use reports, whereas Bennett and Prance[42] reported Asteraceae and Lamiaceae as the most dominant medicinal plant families. Further, published literature also revealed Asteraceae, Amaranthaceae, Convolvulaceae, Fabaceae, Solanaceae and Lamiaceae as the most represented medicinal plant families growing in wild[43]. The reason could be wider distribution, abundance and predominant herbaceous habit that attributed to their luxuriant growth in harsh and humid climates on hills, mountain and valleys. Wide consumption of species from these families might relate to the presence of very effective ingredients present in the plants which can cure the local ailments[44], and literature suggests that members of these groups concentrate exceptionally biologically active compounds as a function of their habit or their life strategies[45-46].

Among the dicot group of plants, frequently used species according to various informants were *Achyranthes aspera* L. (Amaranthaceae), *Azadirachta indica* A. Juss (Meliaceae), *Calotropis procera* (Aiton) W. T. Aiton (Apocynaceae), *Euphorbia hirta* L. (Euphorbiaceae), *Solanum americanum* Mill. (Solanaceae), *Taraxacum campylodes* G. E. Haglund (Asteraceae), *Tinospora sinensis* (Lour.) Merr. (Menispermaceae), *Viola odorata* L. (Violaceae) and *Zanthoxylum armatum* DC. (Rutaceae). Local use of *A. Aspera* is to cure gastrointestinal, respiratory, physical pains and their associated disorders. Research study has reported that *A. aspera* is used to cure asthma and cough, bites of insects and reptiles, and also provide relief from toothache[47]. Leaves of *A. indica* used as an insect repellent in the study area, and it is supported by published literature which indicated leaves have strong antibacterial activity and used for reducing the parasitic load of animals[48-49]. *E. hirta* is used to cure female disorders, followed by application in cough and asthma in the study area. This is supported by literature where this plant is mentioned to be used to cure cough, piles, urine problem in children's and various biological activities such as anti-microbial, anti-malarial, anti-inflammatory, anti-asthmatic, anti-diarrheal, anti-oxidant, and anti-fertility[50-51].

Similarly, the local inhabitants of the study area use *S. americanum* and *C. procera* to cure ulcer, skin disease, and apply on scorpion bites. The published record indicated *S. americanum* is extensively employed in folklore medicine to cure liver problems, skin disease (ringworm), swelling, and fevers, and serves as antimicrobial activity[52]. *C. procera* reported to possess strong antioxidant and antibacterial activities, and flowers are shows anthelmintic activity against nematodes of sheep[53]. Roots of *T. officinale* is used as a diuretic by the local people in the study area, which is again supported by data which indicated the local use of boiled leaves as pre-and post-pregnancy food for ladies to overcome weakness and regarded as a rich source of minerals, vitamins, high protein, fibre and linoleic acid[54]. The most common locally available climber is *T. sinensis* which according to local inhabitants is used as antidiabetic, hair tonic, and brain tonic. In a study, Sharma *et al.* reported that *Tinospora* is used to treat premature ejaculation & erectile dysfunction and increases

sexual stamina[55]. During this study, it was observed that the whole plant of *V. odorata* is used to cure respiratory troubles (asthma, cough) and fever. A published report suggests that application of this plant species in cough, fever, and jaundice is due to the presence of active constituents in the form of alkaloid, glycoside, saponins, methyl salicylate, mucilage, and vitamins[56]. However, another study reported usages of *V. odorata* in cancer, urinary infections, rheumatism, kidney, and liver disorders[57]. Another very important shrub of the region is *Z. armatum* whose bark is used to cure high fever and fruits are used to cure toothache in the Jammu province. An earlier study has reported *Z. armatum* as a multi-utility wild plant used to cure tooth decay, asthma, and serves as a blood purifier. Besides, the fruit and the seeds of this species are used as a tonic, cure malarial fever, and remove worms from the stomach[58]. Sati *et al.*[59] highlighted this plant as a life saving wild plants employed in the Indian system of medicines which is used as carminative and anthelmintic.

As far as the monocot group of plants are concerned, *Acorus calamus* L. and *Asparagus adnascens* Roxb. are the two most frequently used plant in the study area. During the present study, rhizomes of *A. calamus* were used as carminative, stimulant, and tonic, however, this species is also used for removing intestinal worms and parasites. Reported studies indicated tablets made from rhizomes are given to children along with honey as memory enhancers, for curing speech disorders and act as neuro-protective[60-61]. Another interesting climber growing in the study area is *A. adnascens* whose tubers show cooling and diaphoretic effect and this report is in-line with earlier documented record where the plant is used to cure debility, infertility and menopause in women, stomach ulcers, leucorrhoea, and chronic fevers[62].

Conclusion

This investigation recorded the use of 226 traditional medicinal plants of Jammu Province. The results show a loss of local traditional knowledge as the key information on medicinal plants is lying with the old generation which needs to be passed on to the next generation, and that is not happening due to modernization. The use of native plants ensures the connection of indigenous knowledge associated with people, which means that the indigenous communities live in complete harmony with nature and their daily needs are generally provided by their surroundings. Anthropogenic activities pose a serious threat to species diversity; therefore, vulnerable and other threatened plants should be addressed by ecosystem restoration measures. There are several highly valued species in the local system of medicine that remain understudied, and this study could thus provide a starting point for further studies that may lead to the discovery of new molecules. The species with unique active constituents should be conserved first on a priority basis. This research will add more value to the development of functional models for biocultural diversity conservation, restoration, and sustainable uses of natural resources in the Himalayas.

Conflict of Interest

The authors declare that they have no conflicts of interest for this manuscript.

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